299-E33-288 (A7084)

Log Data Report

Borehole Information:

Borehole: 299-E33-288 (A7084)			Site: 216-B-38 Trench		
Coordinates (WA State Plane)		GWL (ft)[1]: n/a[2]		GWL Date: n/a	
North (m)	East (m)	Drill Date	TOC[3] Elevation (ft)	Total Depth (ft)	Type
137324.954	573436.462	08/82	669.4	52.41	cable tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Steel (welded)	3.35	8.625	8.0	0.3125	0	52.41

Borehole Notes:

The casing depth and size information provided above are derived from direct measurements collected in the field by MACTEC-ERS personnel. These measurements are referenced to the top of casing. The borehole coordinates are derived from HWIS[4]. The drilling date reported is from *Hanford Wells* (Chamness and Merz 1993).

Logging Equipment Information:

Logging System:	Gamma 1D	**Type:**	SGLS
Calibration Date:	07/01	**Calibration Reference:**	GJO-2001-243-TAR
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0
Logging System:	Gamma 1C	**Type:**	HRLS
Calibration Date:	02/02	**Calibration Reference:**	GJO-2002-309-TAR
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2 Not used	3		
Date	10/09/01	10/10/01	10/10/01		
Logging Engineer	Musial	Musial	Musial		
Start Depth	52.0	28.0	28.0		
Finish Depth	27.0	3.5	3.5		
Count Time (sec)	100	100	100		
Live/Real	R	R	R		
Shield (Y/N)	N	N	N		
MSA Interval (ft)	0.5	0.5	0.5		
ft/min	n/a	n/a	n/a		
Pre-Verification	A0012CAB	A0014CAB	A0014CAB		
Start File	A0013000	A0014000	A0014051		
Finish File	A0013051	A0014049	A0014100		
Post-Verification	A0013CAA	A0015CAA	A0015CAA		

High Rate Logging System (HRLS) Log Run Information:

Log Run	1	2	3		
Date	02/12/02	02/13/02	02/13/02		
Logging Engineer	Kos	Kos	Kos		
Start Depth	21.0	28.0	52.0		
Finish Depth	29.0	41.0	47.0		
Count Time (sec)	300	300	300		
Live/Real	L	L	L		
Shield (Y/N)	N	N	N		
MSA Interval (ft)	0.5	0.5	0.5		
ft/min	n/a	n/a	n/a		
Pre-Verification	D0005CAB	D0007CAB	D0007CAB		
Start File	D0006000	D0007000	D0007027		
Finish File	D0006016	D0007026	D0007037		
Post-Verification	D0006CAA	D0008CAA	D0008CAA		

Logging Operation Notes:

SGLS and HRLS logging were performed in this borehole during October 2001 and February 2002, respectively. The reference depth for logging measurements is the top of casing. A depth return error of 3 ft occurred during log run 2 (SGLS) requiring the interval to be re-logged as log run 3. The HRLS was utilized to perform logging in selected high gamma flux zones, generally where SGLS dead time exceeded 40 percent. These zones included depths between 21 and 41 ft and between 47 and 52 ft. A short interval between 42 and 46 ft was not logged with the HRLS even though the SGLS dead time exceeded 40 percent. The concentration range between about 1,000-3,000 pCi/g (^{137}Cs) is near the margin of both systems to provide reliable data. It was deemed the SGLS data in this interval were more reliable than the HRLS at the reported concentration levels. No data repeat sections were collected in this borehole.

Analysis Notes:

Analyst:	Henwood	Date:	03/06/02	Reference:	MAC-VZCP 1.7.9, Rev. 2

Pre-run and post-run verifications of the logging tools were performed for each day's log event. Acceptance criteria were met for the SGLS and HRLS, indicating correct performance of the logging systems.

A casing correction for 0.322-in.-thick casing was applied to the log data even though the field-measured thickness was 0.3125 in. This value is within the error of the field measurement and represents the published thickness for ASTM schedule-40 steel pipe, a common borehole casing at Hanford.

Each spectrum collected during a log run was processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Concentrations were calculated with EXCEL using an efficiency function and corrections for casing as appropriate. EXCEL templates named G1dJul01.xls and G1cFeb02.xls were used to process the SGLS and HRLS data, respectively. Dead time corrections are applied to log data, including the total gamma data, where the dead time is in excess of 10.5 percent. In zones of high dead time (> 40%), pulse pileup and peak spreading effects tend to result in underestimation of peak count rates. Calculated concentrations may not be reliable and may be significantly higher than the reported values, especially at higher dead times. The HRLS is utilized in zones of high SGLS dead times to quantify the ^{137}Cs concentrations. The ^{214}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations rather than the ^{214}Bi peak at 609 keV. The 609-keV energy peak cannot be distinguished as a result of interference from the ^{137}Cs peak at 662 keV in higher concentration zones.

Log Plot Notes:

Separate log plots are provided for the man-made radionuclide (^{137}Cs), naturally occurring radionuclides (^{40}K, ^{238}U, ^{232}Th [KUT]), a combination of man-made, KUT, total gamma and moisture, and total gamma and dead time; the moisture data were collected by Waste Management NW in 1999. Data collected with the HRLS are plotted with the SGLS data where appropriate. In addition a comparison plot of the SGLS, HRLS, and Waste Management's Radionuclide Logging System (RLS) ^{137}Cs concentration data is provided. The RLS ^{137}Cs data are decay-corrected from 1999 to February 2002.

For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing corrections. These errors are discussed in the calibration report.

Results and Interpretations:

The man-made radionuclide detected in this borehole is ^{137}Cs. ^{137}Cs is detected almost continuously from near the ground surface to the total depth of the borehole. The maximum concentrations approach 10^5 pCi/g between about 28 and 36 ft. The concentration at total depth is about 10,000 pCi/g, suggesting the borehole was not deep enough to penetrate the entire contamination zone.

The RLS ^{137}Cs concentration data compare favorably with the SGLS and HRLS concentrations. The contaminant profile does not appear to have changed significantly since 1999.

The moisture data were collected in 1999 by Waste Management NW. The two high moisture zones at about 6 ft and between 20 and 28 ft appear to lie at depth intervals just above the high ^{137}Cs concentration zone at 9.5 ft and in the top 8 ft of a high ^{137}Cs concentration zone that extends from about 20 ft to the total depth of the borehole.

The KUT logs do not delineate any definitive lithologic units. Changes in the ^{40}K concentrations from near 10 pCi/g at 20 ft to 17 pCi/g at about 42 ft suggest a lithologic change occurs in the high rate interval. This change is likely the transition from the coarse-grained sediments of the Hanford H1 to the finer grained sediments of the Hanford H2.

References:

Chamness, M.A. and J.K. Merz, 1993. *Hanford Wells*, PNL-8800, UC-903, Pacific Northwest Laboratory, Richland, Washington.

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[1] GWD – groundwater depth relative to top of casing
[2] N/A – not applicable
[3] TOC – top of casing
[4] HWIS – Hanford Well Information System

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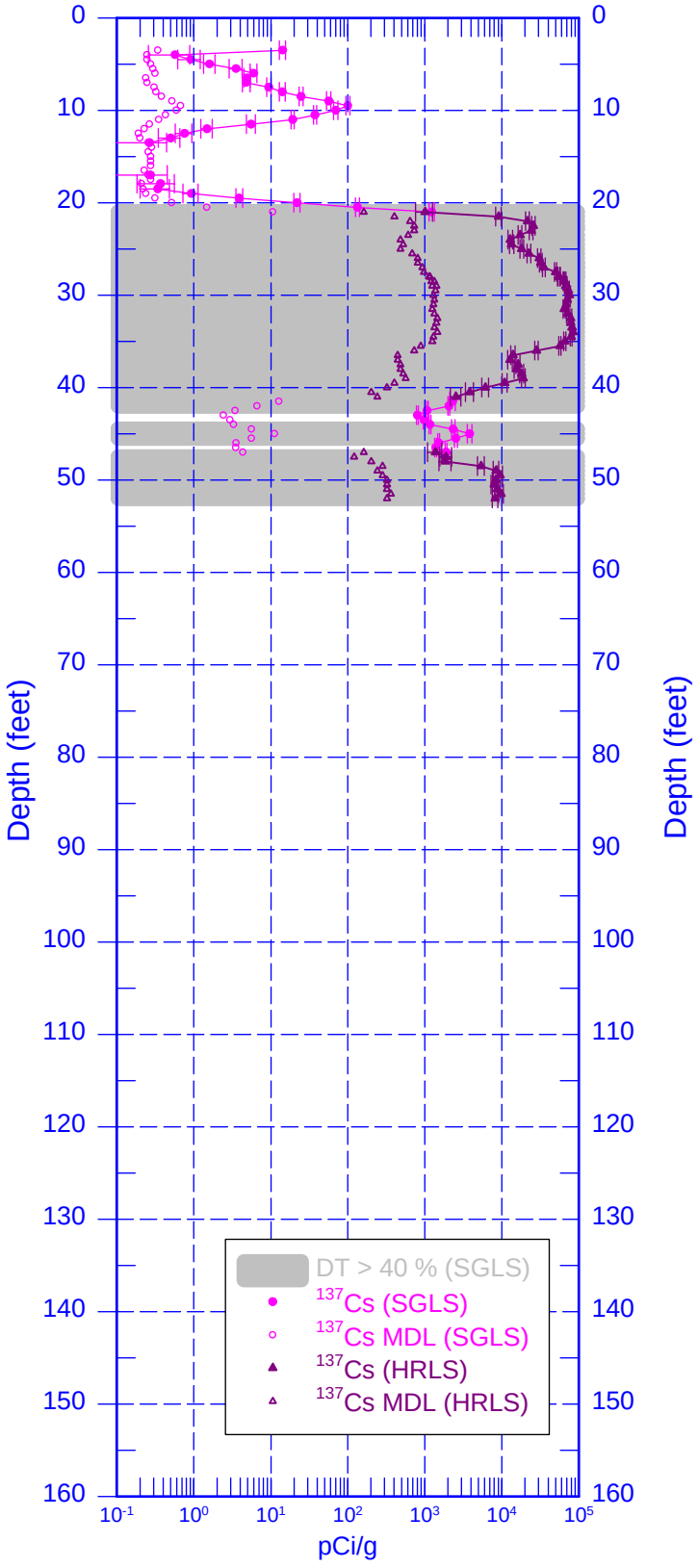
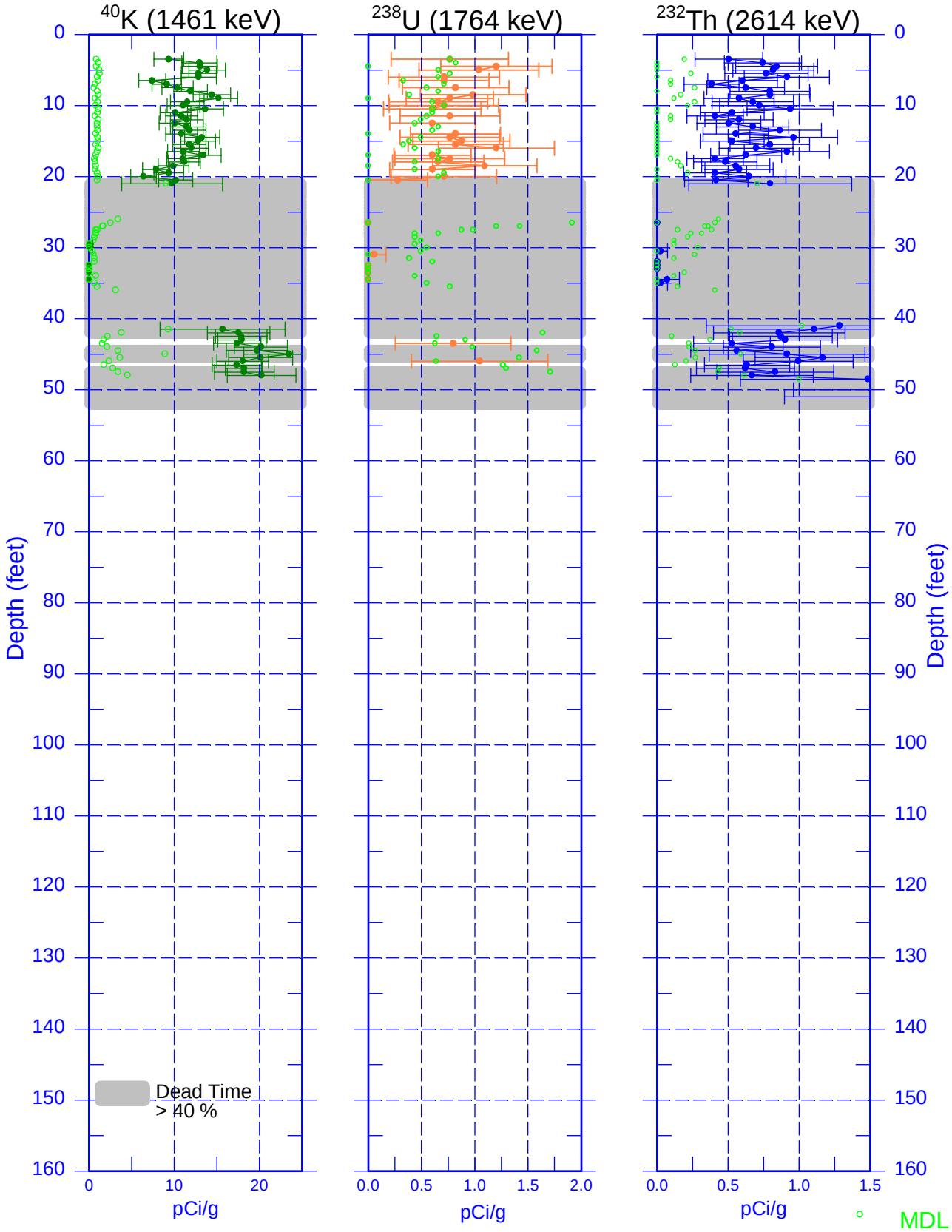
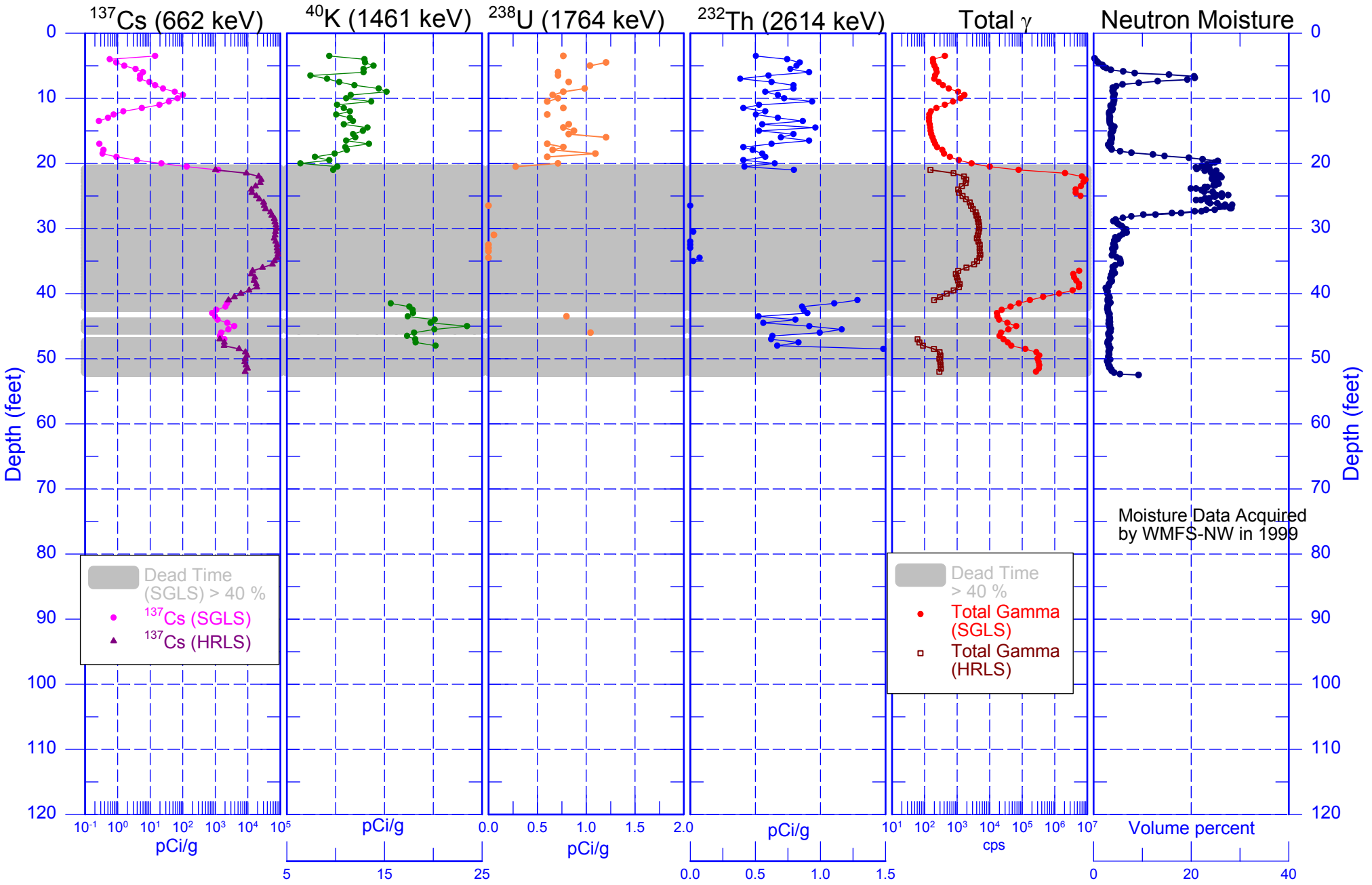
Man-Made Radionuclide Concentrations



299-E33-288 (A7084)
Natural Gamma Logs



299-E33-288 (A7084) Combination Plot



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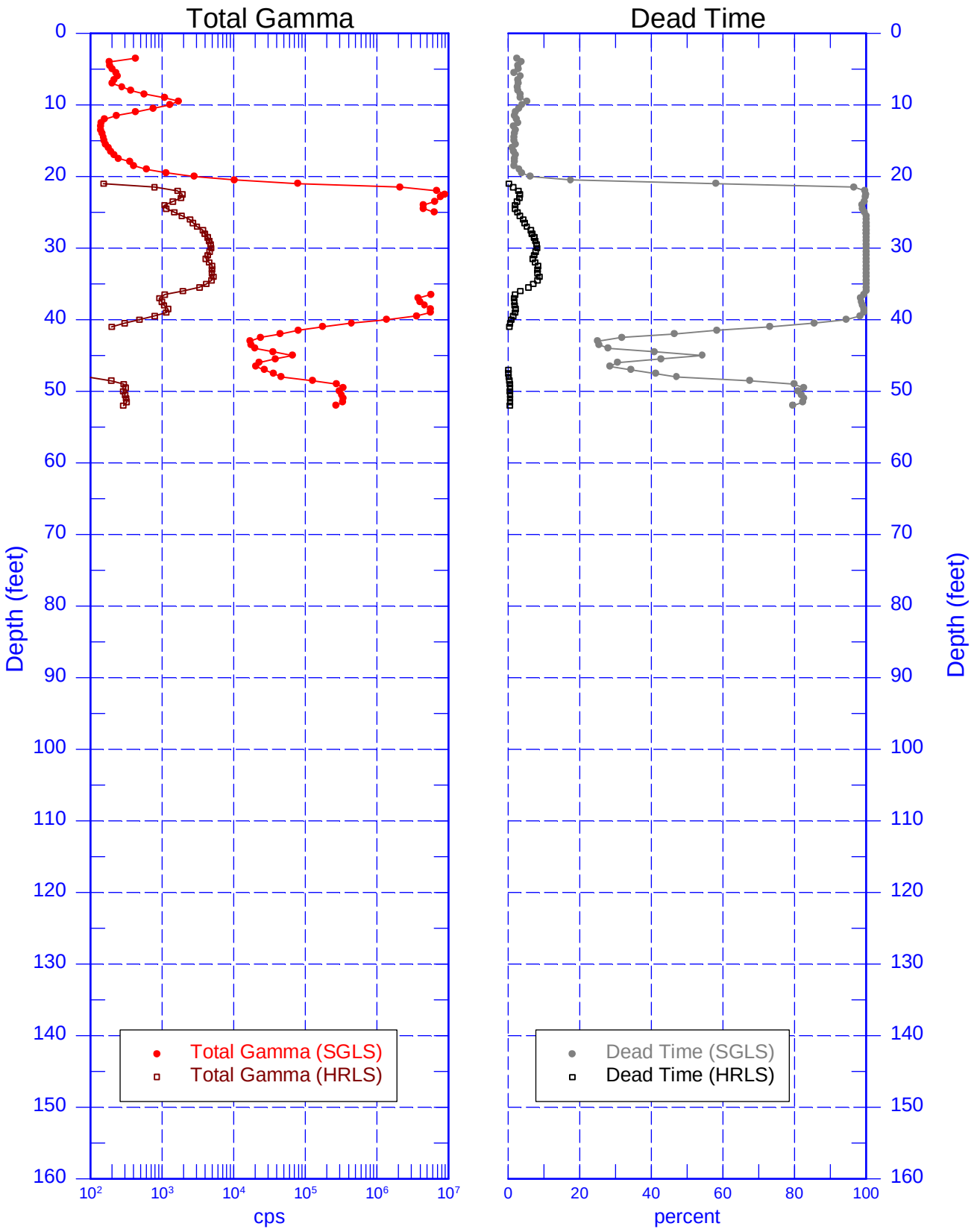
Total Gamma & Dead Time



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Comparison Log of RLS, SGLS, and HRLS Data